

The Development of an Optic Fiber Based Hybrid Spectroscope, Phase I

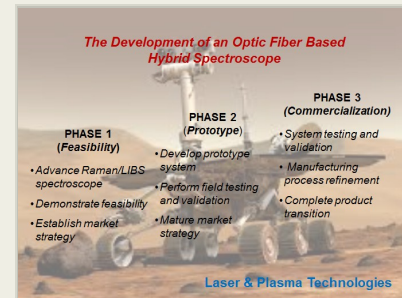
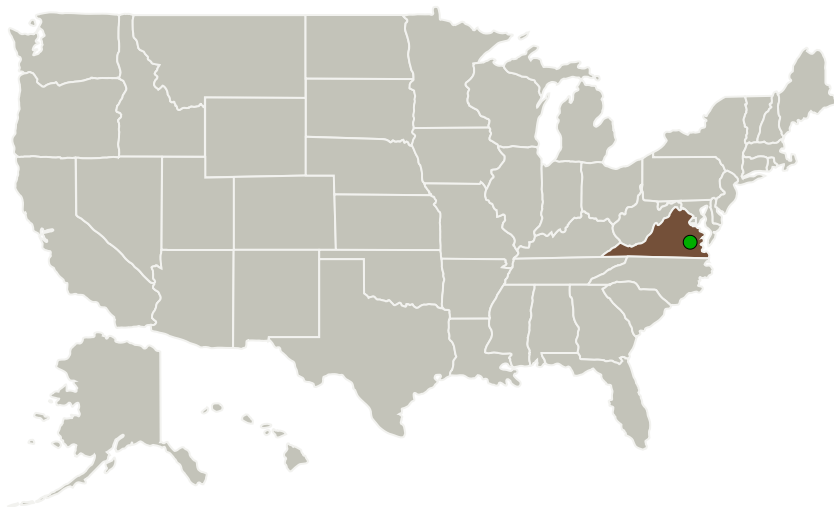
Completed Technology Project (2017 - 2018)



Project Introduction

Laser & Plasma Technologies (LPT), teamed with the National Science Foundation (NSF) Center for Lasers at the University of Virginia (UVA), proposes an advanced optical fiber coupled hybrid spectroscope for in situ characterization of organic compounds. The proposed approach provides information on organic compounds by analyzing spectra obtained from Laser Induced Breakdown Spectroscopy (LIBS) and Raman Spectroscopy (Raman) with a novel approach of using a single pulsed laser. The hybrid spectroscope yields elemental compositions from LIBS and molecular information from Raman strongly complement each other. The use of optical fibers offers advantages of small, light, and flexibility for various NASA planetary missions. An innovative laser beam scanning head provides an ultra-compact solution to achieve 1D or 2D raster scanning from a robotic arm. LPT has extensive expertise in material detection and monitoring by optical sensing technologies. The expertise combined with LPT's core competencies in advanced laser micromachining and optical sensing, provides a solid foundation to achieve the goal of this project. A Technology Readiness Level (TRL) of 4 is anticipated by the end of the Phase I project.

Primary U.S. Work Locations and Key Partners



The Development of an Optic Fiber based hybrid Spectroscope, Phase I Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
Laser & Plasma Technologies, LLC	Lead Organization	Industry	Hampton, Virginia
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
University of Virginia-Main Campus	Supporting Organization	Academia	Charlottesville, Virginia

Primary U.S. Work Locations

Virginia

Project Transitions

▶ **June 2017:** Project Start

✓ **June 2018:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140511>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Laser & Plasma Technologies, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

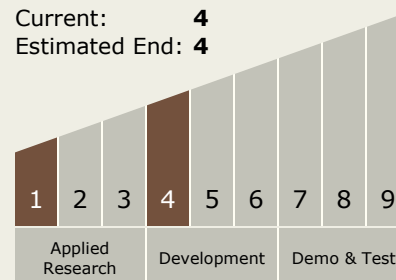
Program Manager:

Carlos Torrez

Principal Investigator:

Guoqing (paul) Shen

Technology Maturity (TRL)

Start: **1**Current: **4**Estimated End: **4**

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Images



Briefing Chart Image

The Development of an Optic Fiber based hybrid Spectroscope, Phase I Briefing Chart Image
(<https://techport.nasa.gov/image/134218>)

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.3 In-Situ Instruments and Sensors
 - └ TX08.3.4 Environment Sensors

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System